AMENDMENTS TO THE CLAIMS

Please replace all previous versions of the claims with the following listing:

1. (Canceled).

2. (Currently amended) The ~~method~~ device according to claim 12[[1]], wherein the heat exchanger is the evaporator.

3. (Currently amended) The ~~method~~ device according to claim 12[[1]], wherein the heat exchanger is the condenser.

4. (Currently amended) The ~~method~~ device according to claim 12[[1]], wherein the means for determining ~~establishing~~ the first rate of heat flow ~~is determined by~~ establishes[[ing]] a heat exchange fluid mass flow and a specific enthalpy change of the heat exchange fluid across the heat exchanger.

5. (Currently amended) The ~~method~~ device according to claim 4[[1]], wherein the means for determining the first rate of heat flow establishes[[ing]] the heat exchange fluid mass flow as a constant based on empirical data or based on data obtained under faultless operation of the system.

6. (Currently amended) The ~~method~~ device according to claim 4, wherein the means for determining the first rate of heat flow comprises means for sensing ~~establishing the specific enthalpy change of the heat exchange fluid across the heat exchanger based on measurements of the~~ heat exchange fluid temperature before and after the heat exchanger.

7. (Currently amended) The ~~method~~ device according to claim 12[[1]], wherein the means for determining ~~establishing~~ the second rate of heat flow ~~of the refrigerant by~~ establishes[[ing]] a refrigerant mass flow and a specific enthalpy change of the refrigerant across the heat exchanger.

8. (Currently amended) The ~~method~~ device according to claim 12[[7]], wherein the means for determining the second rate of heat flow establishes[[ing]] the refrigerant mass flow based on a flow characteristic of the expansion device, and the expansion device opening passage and/or opening period, and an absolute pressure before and after the expansion device, ~~and if necessary any~~ without measuring subcooling of the refrigerant at the expansion device entry.

9. (Currently amended) The ~~method~~ device according to claim 12[[7]], wherein the means for determining the second rate of heat flow establishes[[ing]] the specific enthalpy difference of the refrigerant flow based on registering the ~~temperature and~~ pressure of the refrigerant at expansion device entry and ~~registering the refrigerant evaporator exit temperature and~~ the refrigerant evaporator exit pressure or the saturation temperature of the refrigerant at the evaporator inlet.

10. (Currently amended) The ~~method~~ device according to claim 12[[1]], wherein ~~establishing a~~ the residual is derived as a difference between the first rate of heat flow and the second rate of heat flow.

11. (Currently amended) The ~~method~~ device according to claim 10, wherein the evaluation means evaluates the refrigerant mass flow ~~providing a fault indicator~~ by means of ~~the residual, the~~ a fault indicator $S_{\mu_1,i}$ ~~being~~ provided according to the formula:

$$S_{\mu_1,i} = \begin{cases} S_{\mu_1,i-1} + s_{\mu_i}, \; when \; S_{\mu_1,i-1} + s_{\mu_1,i} > 0 \\ 0, \; when \; S_{\mu_1,i-1} + s_{\mu_1,i} \le 0 \end{cases}$$

where $s_{\mu_1,i}$ is calculated according to the following equation:

$$s_{\mu_1,i} = -k_1\left(r_i - \frac{\mu_0 + \mu_1}{2}\right)$$

where

r_i: residual

k_1: proportionality constant

μ_0: first sensibility value

μ_1: second sensibility value.

12. (Currently amended) A flash gas detection device for a vapour-compression refrigeration or heat pump system comprising a compressor, a condenser, an expansion device, and an evaporator interconnected by conduits providing a flow path for a refrigerant, wherein the device comprises:

means for determining a first rate of heat flow of a heat exchange fluid flow across a heat exchanger of the system and a second rate of heat flow of the refrigerant across the heat exchanger, and using the rates of heat flow for establishing an energy balance from which a residual ~~parameter~~ for monitoring the refrigerant mass flow is derived; and

evaluation means for evaluating the refrigerant mass flow, and ~~generate~~ providing an output signal indicating the presence or absence of flash gas, based on the residual,

wherein the means for determining the second rate of heat flow uses inputs from means for sensing absolute refrigerant pressure before and after the expansion device, means for establishing an opening passage or opening period of the expansion device, and means for storing a value representing a flow characteristic of the expansion device, without requiring measurement of refrigerant temperature at expansion device entry and exit.

13. (Currently amended) The device according to claim 12, wherein the means for determining the first rate of heat flow comprise[[s]] means for sensing heat exchange fluid temperature before and after a heat exchanger.

14. (Currently amended) The device according to claim 11, wherein the evaluation means provides the output signal indicating the presence or absence of flash gas according to the formula:

$$output\_signal = \begin{cases} \text{PRESENT, when } S_{\mu_1,i} > \text{a predetermined value;} \\ \text{ABSENT, otherwise.} \end{cases}$$

~~12, wherein the means for determining the second rate of heat flow comprises means for sensing the refrigerant temperature and pressure at~~

~~expansion device entry, and means for establishing the pressure at the expansion device exit or the saturation temperature.~~

15. (Currently amended) The device according to claim 12, wherein the means for ~~establishing~~ determining the second rate of heat flow ~~comprises~~ establishes the refrigerant heat flow according to the equation:

$$\dot{Q}_{ref} = k_{\exp}\left(P_{con} - P_{ref,out}\right) \times OP \times \left(h_{ref,out} - h_{ref,in}\right)$$

where

$\dot{Q}_{ref}$ is the second rate of heat flow;

k_{exp}: proportionality constant representing the flow characteristic of the expansion device;

P_{con}: refrigerant pressure in the condenser;

$P_{ref,\,out}$: refrigerant pressure at the evaporator exit;

OP: opening period or opening passage of the expansion device;

$h_{ref,\,out}$: refrigerant enthalpy at the evaporator exit, based on $P_{ref,out}$; and

$h_{ref,in}$: refrigerant enthalpy at the evaporator entry, based on $P_{ref,out}$.

~~means for sensing absolute refrigerant pressure before and after the expansion device and means for establishing an opening passage or opening period of the expansion device~~.

16. (Currently amended) The device according to claim 12, wherein the evaluation means comprises means for ~~establishing a~~ deriving the residual as a difference between a first value, which is made up of the mass flow of the heat exchange fluid flow and the specific enthalpy change across ~~a~~ the heat exchanger ~~of the system~~, and a second value, which is made up of the ~~refrigerant~~ mass flow and the specific ~~refrigerant~~ enthalpy change of the refrigerant across ~~a~~ the heat exchanger ~~of the system~~.

17. (Previously presented) The device according to claim 12, wherein the device further comprises memory means for storing the output signal and means for comparing said output signal with a previously stored output signal.

18. (Currently amended) ~~A computer-implemented method for detecting flash gas in a vapour-compression refrigeration or heat pump system comprising a compressor, a condenser, an expansion device, and an evaporator interconnected by conduits providing a flow path for a refrigerant, the method~~ The device according to claim 12, further comprising ~~the steps of:~~

~~determining a first rate of heat flow of a heat exchange fluid flow across a heat exchanger of the system and a second rate of heat flow of the refrigerant across the heat exchanger;~~

~~using the rates of heat flow for establishing an energy balance from which a parameter for monitoring the refrigerant flow is derived; and~~

means for activating an alarm based on the output signal indicating presence of flash gas ~~parameter exceeding a pre-determined threshold value~~.

19. (New) A flash gas detection device for a vapour-compression refrigeration or heat pump system comprising a compressor, a condenser, an expansion device, and an evaporator interconnected by conduits providing a flow path for a refrigerant, wherein the device comprises:

means for determining a first rate of heat flow of a heat exchange fluid flow across a heat exchanger of the system and a second rate of heat flow of the refrigerant across the heat exchanger, and using the rates of heat flow for establishing an energy balance from which a residual for monitoring the refrigerant mass flow is derived; and

evaluation means for evaluating the refrigerant mass flow, and providing an output signal indicating the presence or absence of flash gas, based on the residual,

wherein the means for determining the second rate of heat flow uses inputs from means for sensing absolute refrigerant pressure before and after the expansion device, means for establishing an opening passage or opening period of the expansion device, and means for storing a value representing a flow characteristic of the expansion device, and determines the refrigerant mass flow according to the equation:

$$\dot{m}_{ref} = k_{\exp} \cdot \left(P_{con} - P_{ref,out} \right) \cdot OP$$

where

$\dot{m}_{ref}$: refrigerant mass flow

$k_{\exp}$: value representing the flow characteristic of the expansion device

P_{con}: absolute refrigerant pressure before the expansion device

$P_{ref,out}$: absolute refrigerant pressure after the expansion device

OP: opening passage or opening period of the expansion device,

without requiring measurement of refrigerant temperature at expansion device entry and exit.

20. (New) A flash gas detection device for a vapour-compression refrigeration or heat pump system comprising a compressor, a condenser, an expansion device, and an evaporator interconnected by conduits providing a flow path for a refrigerant, wherein the device comprises:

means for determining a first rate of heat flow of a heat exchange fluid flow across a heat exchanger of the system and a second rate of heat flow of the refrigerant across the heat exchanger, and using the rates of heat flow for establishing an energy balance from which a residual for monitoring the refrigerant mass flow is derived; and

evaluation means for evaluating the refrigerant mass flow, and providing an output signal indicating the presence or absence of flash gas, based on the residual,

wherein the means for determining the second rate of heat flow uses inputs from means for sensing absolute refrigerant pressure before and after the expansion device, means for establishing an opening passage or opening period of the expansion device, and means for storing a value representing a flow characteristic of the expansion device, and the evaluation means provides the output signal indicating the presence of flash gas in case the time average of the residual is less than zero.